EE/CprE/SE 4920 SPRINT REPORT 4

3/1/25 - 3/14/25

Group number: 40

Project title: Hybrid Relightable 3D Gaussian Rendering

Client: Jackson Vanderheyden & Brian Xicon

Advisor: Simanta Mitra

Sprint Summary:

	Sprint Tasks	**Accomplished Tasks**	**Tasks for Next Sprint**
Ethan	-ML: Explore techniques on running python scripts within the unity environment -ML: Create .cs script to run python scripts within Unity scenes -ML: Test .cs script on python scripts within Unity scenes -ML: Fix bug within SfM script with user selected paths having format issues	-ML: Created a generic .cs script that can run basic python scripts on scene start. -ML: Tested the daPythonRunner.py file (for functionality) on the video2image.py Runner works as expected. -ML: Made progress on SfM script bugs, however bugs still remain, but temporary work around was found.	-ML: Assist in and review the Gaussian optimizer as needed. -ML: Test and refine the daPythonRunner.cs script on remaining python files. -ML: Fix bug within SfM script with user selected paths having format issues
Kyle	-Install ONNX on the newest version of our code. -Turn the optimizer model into ONNX file. -Have pair programming session with Brian.	-Installed ONNX on the newest version of our code. -Worked with Ethan to create a runner to run the SFM code.	-Put the pieces together . -Have the python runner running in Unity. -Have the optimizer running on in Unity.

Jackson	-GP: Code review for Luke's BVH Merge Request -GP: hybrid rendering of ray Gaussian closest-hit intersection	-GP: hybrid rendering of ray Gaussian closest-hit intersection	-GP: Code review for Luke's BVH Merge Request -GP: multiple-intersection hybrid rendering -GP: polish up by completing lower priority tasks + regroup with ML to get an MVP working
Luke	- Merge BVHs into main branch. - Research BVH generation for Gaussians	- Research BVH generation for Gaussians	- merge bvhs into main branch - BVH generation for Gaussians
Brian	-ML: Optimize camera angles for training ML models off our premade images. -ML: Create ML model and optimize it to work with different values of Gaussians like color, texture, etc.	-ML: Finished the retrieval and processing of our image data, images of point cloud are now optimized to match the truth images	-ML: Create a working renderer to use for data processing. -ML: Work on the first prototype of the Gaussian Point Optimizer model

<u>Ongoing Tasks:</u>

Graphics Programming (GP) Team:

- ☐ Merge BVHs into the main branch **[High Priority]**
- ☐ Write ray-gaussian intersection code **[High Priority]**
- ☐ Physically based lighting calculations **[High Priority]**
- ☐ Update necessary buffers on scene update **[Medium Priority]**
- ☐ Handle multiple paths per pixel **[Medium Priority]**
- ☐ Support Unity lights **[Medium Priority]**
- ☐ Add pathId as a unique identifier in getSeed() **[Low Priority]**
- ☐ Improve workgroup count **[Low Priority]**
- ☐ Remove bounce from Path struct and add a pathBounce counter buffer **[Low Priority]**
- ☐ Vary primary ray generation **[Low Priority]**

- [ ] Cube map background support **[Low Priority]**

Machine Learning (ML) Team:

- [ ] Prep point cloud data by removing noise and outliers **[Medium Priority]**
- [x] ~~Create a ML model to convert a point cloud into a Gaussian point cloud.~~**~~[High Priority]~~**
- [ ] Test accuracy of Gaussian point cloud generation **[Low Priority]**
- [x] ~~Modify SfM script to accept user selected paths~~ **~~[Low Priority]~~**
- [ ] Fix bug within SfM script with user selected paths having format issues**[HIGH Priority]**
- [x] ~~Video to images support for preprocessing~~ **~~[Low Priority]~~**
- [ ] Extract original lighting from models **[Low Priority]**
- [x] ~~Create .cs script to run python scripts within Unity scenes~~ **~~[Medium Priority]~~**
- [ ] Test .cs script on all python scripts within Unity scenes **[Medium Priority]**
- [x] ~~Explore techniques on running python scripts within the unity environment~~**~~[Medium Priority]~~**